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IN ADVANCE.

Pickering's Improved Velocipede.

Attempts to improve and simplify the Velocipede, and adapt it for use in this country, have resulted in the production of a vehicle of which the following is a general description:

The reach of frame of this Velocipede is tabular, and thereby great strength and lightness are secured. The bearings are all of composition or gun-metal, and so attached that when too much worn they may be replaced by others, which are interchangeable like the parts of sewing-machines and fire arms. The hub of the hinder wheel is bushed with composition or gun-metal; and the axle is of peculiar construction, constituting in itself an oil box by being made tubular and closed at either end by a screw, on the removal of which, it may be filled with lard oil. This oil finds its way out to the bearing as fast as required, through two or three fine holes made for the purpose in the axle.

PICKERING'S IMPROVED AMERICAN VELOCIPEDE.

One important feature is the arrangement of the tiller or steering-handle, which is brought well back and sufficiently high to require the rider to maintain an erect position, with his arms well back and hands well separated, thus keeping the chest expanded and allowing free play of the lungs. As considerable exertion is required by the arms to counteract the effect of the alternate pressure of the feet upon either crank of the driving-wheel, the exercise is extremely developing to the arms, and to the chest also.

The stirrups require notice, as they differ essentially from those of other Velocipedes, which permit only the shank of the boot to set on them and have their single flat side kept in position by a weight cast on the bottom. The stirrups of this Velocipede have their exteriors three-sided, with circular flanges at each end, and as they are fitted to turn on the crank-pins, the pressure of the foot will always bring one of the three flat sides into proper position. These flat sides are roughened to prevent the foot from slipping, and are so shaped as to permit the use of the fore part of the foot and bring the ankle joint into play, and thereby relieve the knee considerably, making the propulsion much easier than when the shank of the foot is used exclusively. The cranks are made adjustable, to suit different persons and different kinds of road and inclines.

The saddle is supported on a spring, giving an elastic seat. The brake is exceedingly simple and effective, being composed of a block of hard wood attached to the under side of the back part of the saddle, which is shaped to form a good brace or rest for the lower part of the back of the rider. The spring of the saddle being adjusted to suit the rider, the brake block clears the face of the hind wheel until it is required to be used, and then a pressure forward against the after part of the saddle with the back, instantly compresses the saddle spring and brings the brake into action on the wheel.

Further particulars can be had on application at the manufactory of Messrs. Pickering & Davis, 144 Greene street, New York.

Erricson's Solar Engine.

As various erroneous expositions of the results reached by Mr. Errickson in the new direction to which he has of late turned his attention have been published, we take occasion to give the substance of what he has himself enunciated in the Stockholm *Aftenbladet*.

He says that by concentrating the sun's rays with apparatus which he has not space to describe, and applying the heat so developed to steam and air engines of special construction, an amount of force can be obtained, which may be thus expressed. The accumulated solar radiation which falls upon a space 10 feet square or 100 square feet in area, can develop more than one horse-power.

This area is, of course, perpendicular to the direction of the rays.

The sun-heat wasted on the roofs of Philadelphia would operate 6,000 steam engines of 20 horse-power each, while the sun shone.

The area of one Swedish square mile (= 48 English), if only half covered with sun machines, would develop force enough for 64,800 steam engines of 100 horse-power each.

At the surface of the sun an area of 10 square feet must emit heat enough to run an engine of 45,984 horse-power.—*Jour. of Franklin Institute.*

—The *Moniteur des Interests Materiels* estimates the total production of copper in the world at large at 93,415 tons. The United States contributed 14,490 tons.

Chemical Repertory.--No. 6.

JANUARY 16, 1869.

Under this head it is my purpose to lay the foundation of what, I trust, may grow in time into a most important, if not the leading, department of this Journal.

Time will be a necessary element in the erection of this, as of any edifice intended to be substantial and enduring. I hope to enlist the assistance of American chemists. This may be an ambitious hope, but time will show.

I shall most cheerfully offer explanations and reply to questions on chemical points, addressed to me at this office; and I solicit all such.

HENRY WURTZ.

8. THE SOLEMN STARS.

The Reverend Father SECCHI announced last summer, to the British Association, results of *stellar* observations with a new spectroscope arrangement, which has enabled him to see the telescopic spectra of stars even of the 7th and 8th magnitude, invisible to the naked eye! His new arrangement consists "in a single prism of that kind which is used for direct vision, combined with a cylindrical lens." He also employs "an eyepiece made with cylindrical lenses only." His conclusions are:

The starry spectra arrange themselves in four groups. The first type embraces almost one half of the visible stars of Heaven. Sirius, Vega, the large stars in the Great Bear (except one), Regulus, Castor, and all the *white* stars, represent it. Their spectrum is an almost uniform prismatic series of colors, peculiarized only by the four very strong black lines which proceed from *hydrogen* (recalling HUGGINS's grand discovery of the gaseous condition of the nebulae). In some stars the lines are longer, in others narrower. The second type is that of the yellow stars, as Capella, Pollux, Arcturus, Aldebaran, *alpha* Ursae Majoris, etc., which have spectra exactly like that of our sun; occasionally, however, the Mg lines, and in some the Fe lines in the green, being very strong. These include almost the other half of the stars. The third is that of the orange or reddish stars, as *alpha* Herculis, *alpha* Orionis, Antares, *theta* Ceti, *beta* Pegasi, etc. Their spectrum shows a row of columns at least eight in number, which are formed by strong luminous bands alternating with darker ones, so arranged by their shadow as to represent *a series of round pillars*, exactly as architects are accustomed to draw a *colonade*. It is quite impossible to describe their beauty on a fine night. Of these he has catalogued 25. All the pillars have their luminous sides towards the red end of the spectrum, while their shadowed sides are towards the violet. The fourth type are *red* stars, some appearing like drops of blood on the field of the telescope. They are very small, none above the sixth magnitude, and he has found 17 of them. Their spectrum consists only of three large bands of light. The spectrum of carbon in a gaseous form has luminous bands corresponding almost to the dark of these stars but not exactly. A fifth type is indicated in *gamma* Cassiopeiae (which is however almost a unique object, the only other example, and that in a very faint degree, being *beta* Lyrae), showing the lines of hydrogen in a luminous state, exactly opposite to the dark ones of all the others, being quite the reverse of the first type. A grand fact, according to SECCHI's observation, is that stars of the same type are crowded occasionally in the same space of the Heavens; their distribution seeming to indicate in space a particular distribution of matter or of temperature in the different regions. SECCHI concludes as follows: —— "the astronomer can only here walk after the lamp of chemistry. We have had already great satisfaction in seeing but lately that brilliancy in a comet was due to the rays of carbon. Ere long we shall more accurately know what nourishes the light and heat in so many bodies scattered in the profundity of space."

In the course of this paper he alludes to the researches now in progress by several eminent spectroscopists to determine the question by spectral means whether the stars are moving to or from us. In a previous paper (*Comptes Rendus*, March, 1868) he has made some interesting remarks on this head: "Physicians admit that motion to or from the ear can modify the pitch of a sounding body. FIZEAU first remarked this and extended it to light. DOPPLER also dwelt upon this point, and SESTINI in 1845 developed DOPPLER's theory and catalogued the colors of the stars. It follows from this view that a luminous body moving *away*, with the velocity of light, will have its color diminished by an octave (in Acoustic nomenclature), and if approaching as fast, increased by an octave. In the first case, a violet star would become almost red, and in the second the converse; and for intermediate velocities of course intermediate variations. Thus stars variable in color, may be sometimes approaching, sometimes receding from us. SECCHI claims that *he* first applied this idea to spectroscopic researches, and made the same public July 31, 1868. He shows that our spectroscopes will detect such a motion when five times that of the earth in its orbit, if towards us, and ten times if from us. His observations did not convince him that any such motions could be ascertained in this way; but HUGGINS, in a paper read to the Royal Society (May 7th, 1868) concludes from *his* observations on this point that Sirius is moving away from us with a velocity of 29.4 miles per second.

The unity of science; arguing the oneness of its origin and source, and the correlation and mutual dependence of its many ramifications are evinced most strongly by the recent contribution, from the *chemical laboratory*, of what promises to be to the astronomer an instrument second in importance only to the telescope. We must in fact admit a new specialty in science, under the name of Astronomical Chemistry, or Chemical Astronomy. With regard to the history of the successive steps which led to the discovery of this instrument of research, the spectroscope, in the chemical laboratory; I would remark that it may not be generally known that American science contributed its full share. Upon this subject I propose again to enter; and have but space to say that I refer particularly, among other things, to the paper of Dr. DAVID ALTER, in the *American Journal of Science* for November, 1854, where the prismatic spectra of a large number of the metals while in electric combustion are actually mapped out. The application to the *identification* of these metals by the same means, is one quite obvious to any chemical mind.

H. W.

CHEMICAL *EXCERPTA*.

Under this head I purpose to gather in the most *condensed* form practicable, from such recent scientific journals, both at home and abroad, as come under my eyes; the substance of such articles as seem deserving thereof. In this work, I shall not, as might be thought, hold myself confined to novel facts alone; regarding new hypotheses, and even speculations, when involving labor and ingenuity in the *generalization* of facts, as even more valuable to Science. It is hardly necessary to add that in my own comments, to which a degree of personal responsibility attaches, a less condensed style than in the abstracts themselves will be inevitable.

HENRY WURTZ.

THE FORMATION OF WATER IN ELECTROLYSIS.

E. BOURGOIN (*Bulletin de la Société Chimique—Sept. and Oct.* 1868, *p.* 206,) asserts the belief that water in all electrolytic actions, plays but the part of a solvent or liquifying medium, and that it is never itself decomposed by the current. He supports this view by the following facts: In the electrolysis of water made alkaline by KO HO, contained in two equal compartments intercommunicating by a very small opening, so disposed that no admixture is possible, it is found that the alkali accumulates at the N. pole. The oxygen from the P. pole is exactly equal in weight to that of the potash electrolyzed. Water does not enter immediately into the reaction; and the following equation represents it:

$$KHO^2 - KH \text{ (N. pole)} + O^2 \text{ (P. pole)};$$

the hydrogen of the residue KH escaping, whilst the K reacts with the water just as it ordinarily does:

$$K + 2HO = KHO^2 + H;$$

thus explaining the accumulation of the alkali at the N. pole.

According to this, all the oxygen is eliminated from the potash, while this latter gives but half the hydrogen, the other half arising from a secondary reaction of the alkali-metal upon the water.

When the water is acidulated with sulphuric acid, on the other hand, so that from 100 to 250 equivalents of water are present for one of SO^3 HO, the acid concentrates at the P. pole:

$$SO^3\,3HO - (SO^3 + O^3) + H^3;$$

but at the P. pole the sulphuric anhydride necessarily assimilates water again and becomes ordinary acid, while the oxygen is evolved:

$$(SO^3 + O^3) + 3HO = 3(SO^3\,HO) + O^3.$$

In more concentrated mixtures, however, such as disengage heat on further addition of water, as for example SO^3 HO + 25HO; the results range between SO^3 2HO and SO^3 3HO, and it appears that these two compounds co-exist in the liquid.

BOURGOIN points out that electrolysis will furnish us a new method of indicating the existence of hydrates in aqueous solutions, and of determining their composition. B. extends his discussion to the electrolysis of nitric, boric, oxalic, benzoic, formic and other organic acids. That of oxalic acid is represented primarily by

$$C^4\,H^2\,O^8 = 2C^2\,O^4 + H^2$$

the oxalic acid accumulating thus at the P. pole.

In all cases, he asserts that all the circumstances of electrolysis are explicable without bringing in the supposition of any direct decomposition of water by the current. If water be acidulated (?) by *boric acid*, perfectly pure, no trace of gas appears at either pole.

Any attempt to do justice here to the many mooted questions connected with the theory of electrolysis, would be futile; but I feel impelled to ask the question whether it would not follow from such views as those of BOURGOIN that in a feebly acidulated liquid, the process should become less and less active, until kept up only in measure as the acid accumulating at the positive pole is redistributed throughout the liquid by the operation of diffusion?—H. W.

We have a loss to mourn; even that of a brother Journal (*The Mining Gazette, of Halifax, N. S.*), whose visits to us during the year past have been among our pleasantest and most profitable incidents. He shall sing to our readers his own song of parting.

"The promoter of the *Mining Gazette* has received so much kind encouragement *from abroad*, that he announces with regret the necessity of discontinuing after this date.

"The publication was undertaken tentatively only, and the present issue will complete the number for the year guaranteed in the prospectus.

"While foreigners of eminence have spontaneously given their support to the enterprise, in Nova Scotia, where the Provincial Exchequer and many private individuals have gained by its establishment, it has failed to elicit much more than compliments, and as good Sancho says: 'Fine words butter no parsnips.'

"The promoter is grateful to all who have manifested an interest in his undertaking, and in bidding his patrons adieu, commends himself to their indulgent remembrance, and wishes them all a Merry Christmas and Happy New Year."—*Dec.* 18, 1868.

It is not to be imagined that any spontaneous suggestion of ours will be heard of *as such*, by the powers that be among our northern neighbors; but so manifest a public debt is due by these people to Mr. HEATHERINGTON, that it would be but meagerly repaid, were they to solicit his continuance of his work in an official way; for example, as a Commissioner for the collection of Mining Facts and Statistics, throughout the new Dominion, in a capacity similar to that filled by Mr. RAYMOND in our country. Could they secure his services in such a capacity and fail to do so, they would fully deserve that in the rapid march of development of the mineral interests of this Continent, their own teeming resources should cry in vain for recognition.

H. W.

The "New York World" versus Science.

The following has been pointed out to us in the New York *World* newspaper:

"A PHILOSOPHER ON ICE.—Prof. Silliman, of Yale College, but more widely known in his relation to the extraordinary mining interests of this country, had a passage in his lecture the other night before the American Institute which discriminates precisely the unscientific spirit from the scientific. Expounding the fact that matter contracts in space as it descends in temperature and the exception in the case of water, which, after contracting in its descent to 40 degrees, then expands in its further descent to the freezing point 32 degrees, where it crystallizes into ice, the Professor observed:

"It is the great delight of a devoted mind to believe that the exception is a part of the original intention of the Great Architect in the formation of the world in adapting it to be inhabited by human beings. * * * If water, as it solidified, continued to shrink and to become heavier, the whole mass would become frozen in a single winter so that no summer would be long enough to melt it, and eternal death would rest upon the globe.'

"Professor Tyndall, the first of living scientists, had fallen in with some English Silliman, apparently, when he wrote his book on "Heat as a Mode of Motion," where he says:"— (a quotation ensues too long for us to make room for.)

We have not many words to spare for the writer of this very witty (?) extract. That which, *for us*, discriminates most "precisely the unscientific spirit from the scientific" is what may be mildly described as the perversion of facts to the support of false analogies. The boy ten years old would merit disgrace who could not detect the fallacies in the unfortunate passage quoted from TYNDALL. The analogy upon which he bases apparently a sneer at those who seek to reconcile the two Revelations found in the Word and Works of GOD, utterly fails to bear the least examination. TYNDALL himself says that when *water* "is chilled, it contracts, becomes thus heavier, and sinks by its superior weight" and so on: but in the case of *bismuth*, "the metal cooled, *solidified*, expanded," etc., and he asserts that the case of *liquid* water expanding by loss of heat "is not an isolated one." Where is the other case? Certainly not bismuth, according to his own showing. In fact the case of water *is* an isolated one, so far as we yet know; and it is to be inferred that it would have

been well had "the first of living scientists" really "fallen in with some English (or American) SILLIMAN," before he wrote his *otherwise* valuable book on "Heat as a Mode of Motion."—H. W.

The Manufacturer and Builder.

The first number of this new American Technological Magazine has been received from WESTERN & Co. of the *American Journal of Mining*. It clearly marks an Era in the history of practical progress in this country, and is significant among the "signs of the times." Its first impression arises from the wonderful copiousness of original literary matter on the subjects within its scope. Considering the ridiculously insignificant cost at which it is offered, this makes it comparable with Samuel Weller's crumpets, "wery fillin, at the price." The debt of gratitude due from American Technologists to the extraordinary enterprise of these publishers will doubtless repress critical strictures; but duty, nevertheless, compels the hint on behalf of American Scientists, that the immediate value *to them* at least, (as it should be to all readers) of original matter, is annulled by lack of the name of the author. Doubtless these gentlemen know their own business, however, and any intention of offering *advice* is here strictly disclaimed. H. W.

The "New World."—The interest, to us and our readers, of this new publication, will be comprised in the promised series of weekly articles from Prof. CHARLES A. JOY, of Columbia College, on recent chemical discoveries concerning the metals. His system will be to take up in a popular style one metal each week, in alphabetical order, condensing all the latest new discoveries concerning it, and he has already commenced with *aluminum*, and will follow in a week, it is to be presumed with *antimony*. The first article, on aluminum should be read, as a matter of education, by all men, women and children, at least who can read. Children, and it may be men, who now live, will live to see the prediction of Prof. JOY verified, that our houses shall be built, not of bricks, made from clay, but of metallic aluminum made from the same. This writing is upon the walls of the temple of Science. This talented writer merits thanks from his fellow-scientists for the conception of his plan, and further thanks will doubtless follow its execution. H. W.

Prof. SEELY'S *American Supplement to the Chem. News.*

To give the "American Reprint" of Mr. CROOKES'S *Chemical News* the full value for American readers of which it is susceptible, it would obviously appear desirable to supplement it with such novel matter as may be contributed to science by American chemists; else it might be assumed that the multitude of Professors of Chemistry in which our country rejoices is a barren stock. It is pleasing to learn that one of our most practical scientists has undertaken this task. In the reprint for December we find a Supplement by Prof. SEELY, with a promise of continuation in the future. An item in this supplement calls for a remark from the present writer. In noticing his Report upon the new method of lime-purification of the Manhattan Gas Co., Professor SEELY says that "the method consists simply in driving air through the purifiers before opening them, and carrying the same air through a supplementary purifier charged with fresh lime." Fresh lime is not in reality used in the supplementary purifier, which is charged with the *ventilated* lime from the primary purifiers. Other details will soon be furnished in resumption of this subject. H. W.

Deodorization and Preservation of Bisulphide of Carbon.—In our last two issues items on this subject have already been given. I now add that I learn from *Le Chimiste*, 1868, page 367, that MILLON'S proposal, which has been claimed also of late, it would appear, by COMMAILLE, of treating the sulphuretted bisulphide with a metal, such as zinc, is wholly devoid of novelty; in so much that in France (Belgium?) the manufacture of bisulphide of carbon for industrial uses involves its rectification in stills made of zinc, and it is put up in cans made of zinc, with the object of maintaining its purity. H. W.

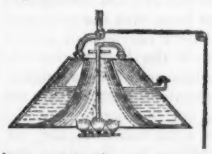
Purification of Iron.—To remove the sulphur, phosphorous, and other impurities from iron and steel manufactured by the Bessemer process, Mr. J. T. Bennett, of Pittsburg, proposes to force through a stream of carbonic acid gas, instead of, or in combination with atmospheric air. He considers that the oxygen of the carbonic acid will combine with the sulphur in the iron, forming sulphurous acid gas, leaving the carbon free in the iron. He states that the same process is applicable to the removal of sulphur and other impurities from the sulphurets of copper, zinc, nickel, and other metals, by passing the blast or current through the metals when in a molten state.

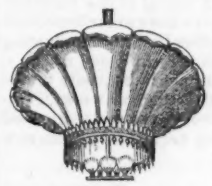
The New Gas and Air Carburettor.

Everyone knows that common coal gas as made and distributed to consumers varies in its illuminating power from time to time very greatly, depending upon several conditions, among which are the following: the quality of coal used at the works; the length of time the charges are run and the degree of heat employed in distillation; the completeness of purification; the distance the gas travels and the amount of *condensation of the hydrocarbon vapors* that takes place before it is consumed.

Some gas companies produce gas having different average illuminating power from other companies, and the gas furnished by all gas companies is liable to vary in illuminating power from day to day.

Various plans have been employed to place in the hands of the consumers an apparatus whereby the gas can be charged with hydrocarbon vapor by passing it through or over the various volatile hydrocarbon fluids in proper receptacles previous to the final combustion of the gas at the burner. In all these efforts, however, the extreme volatility and consequent combustibility of the material has made its general use objectionable on account of its great inflammability and explosiveness. Mr. Joshua Kidd has invented and patented a carburretting apparatus which overcomes the liability to accident, and which is destined to be largely employed to increase the quality of gas and lessen its cost to the consumer. It consists of a metallic vessel partially filled with the heavy distillate of coal tar and petroleum, commonly called creosote or dead oil (which is not inflammable or explosive). The gas enters this vessel at the top as shown by the engravings herewith, and after passing around over the fluid, escapes at the opposite side and is thence conducted to the burner or burners below. The first cut represents a vessel in the form of a hollow truncated cone having a double shell. The fluid is in the space formed by the inner and outer casing, while the interior of the cone serves as a reflector. The vessel is filled by a stopcock at its side, as shown. The other cut is arranged somewhat similar with a dispersing reflector something like a sunlight burner so much in vogue in Europe for theatres and halls of public assembly, etc. Various forms and styles of this excellent apparatus are made to suit all tastes.





The same form of apparatus is also employed to carburet air instead of gas. The air is, of course, to be forced through the pipes by a suitable apparatus.

The cost of the oil is so cheap that ten cents' worth of it, it is said, will increase the illuminating power of 1000 feet of gas equal to 3000 feet. The Hydrocarbon Light and Gas Improvement Company, who are introducing this apparatus, have an office at No. 74 Maiden Lane, New York. The advertisement will be found in another column.

The New York Society of Practical Engineering.

[*Reported Expressly for this Journal.*]

The society held its regular meeting at its room, No. 24 Cooper Building, on the evening of Tuesday, Jan'y 5th; the president, James A. Whitney, in the chair, Wm. B. Harrison, Recording Secretary.

The subject for consideration was "Concrete and its Applications," and a paper on that subject was read by Mr. Charles Rogers, of this city. The writer commenced by describing the state of the art of building among the ancients. Speaking of the mortars used by the Egyptians, he mentioned the fact that the mortar of the pyramids was similar to that used in structures of the present day. The ancient Egyptians were probably skilful as builders, if we may judge by the durability of their works. The Greeks also made considerable advances in this department of industry. During the age of Pericles we find the houses of simple citizens ornamented with stuccos as hard and white as marble. Rome carried the art of the Greeks still further. They have even left hydraulic structures of no mean character. Hydraulic lime, however, was probably unknown to them, for we find no mention of it in the works of their authors. Their mortars were generally composed of pure lime mixed with fragments of bricks coarsely pounded. The bricks probably hastened the dessication of the mortar, thus giving it considerable consistency in a tolerably short time. This mortar seemed to answer for the building of cisterns, aqueducts, etc. However, in laying the foundation of piers for bridges, they were obliged to keep the dams empty for two months so that the mortar might have a chance to set. Concrete and *beton*, as understood at the present day, although originally considered as different substances, are now regarded as the same. Any mixture of hydraulic mortar with coarse materials such as pebbles, shells, gravel, fragments of brick, etc., is called concrete or *beton*. There should always be more mortar in the concrete than is equal in volume to the voids in the coarse materials to be united. The method of making concrete now generally followed by English architects and engineers is, add the coarse materials after the mortar has been made; the lime used in the operation is thoroughly slaked and reduced to pulp. By this process the danger of partial slaking is avoided. The natural hydraulic cements, which abound in the United States, furnish a basis for the concrete used in our own country. Here, the concrete is deposited as soon as made, and well rammed in layers. Concrete has received a very important use, as a foundation for buildings, or walls in light and springy soils. Blocks made of concrete, which harden by exposure, have been made to supply the place of stone, in ashlar-work, rubble, masonry, etc. It has also been used in submarine masonry. In this application it is considered as superior to brick, and, in some cases, equal to the best stone. It has been employed also in building walls, abutments, etc., and as the backing of walls faced with cut stone or brick. Houses have also been built of concrete, both in Europe and the United States. The walls of such houses have several advantages. They allow the ventilating, fire, and smoke flues to be adjusted more readily; they also afford a partial equality of temperature during extremes of weather, and secure a partial immunity from fire. Hydraulic cements of certain varieties have been applied to drainage and sewerage purposes. Pipes for these purposes are made of concrete. The following is a brief sketch of the discussion which followed the reading of the paper.

Prof. Wm. Robinson.—"Evaporation and chemical combination are the two prominent causes of the drying of mortar. Of these, evaporation is certainly the most important. There is in Strasburg a citadel which has been standing for more than a century, in which mortar has been found almost as soft as the day it was laid. Hydraulic limes are composed for the most part of lime and clay. There are other ingredients which enter to a small extent. Care must be exercised in the calcination of these limes, as otherwise chemical combination is likely to ensue. No higher heat is required than is necessary to expel the carbonic acid. The power of resistance to rupture in the case of pure hydraulic cement is equal to fifty-four pounds per square inch, and the power decreases exactly in proportion as sand is added to it."

Dr. A. W. Hall.—"The ancients used in the construction of their works both burned and sun-dried bricks. Mortar, it seems, has a different adhesive power as regards these two materials. When mortar was used in conjunction with burned bricks, it became as hard as the bricks themselves. When sun-dried bricks were employed, however, the mortar has not formed so good a connection, and the buildings into whose structure they entered have long since been obliterated. These facts hold good in the cases of many of the ancient cities, such as Agrigentum, Corinth, Carthage, Alexandria, Babylon, and others."

The President.—"One of the most recent improvements, in the way of masonry, is the formation of artificial stone. This is accomplished by treating a soft compound which hardens by evaporation of water with a solution of a chloride by means of which an almost insoluble stone is produced. The stone, before being treated with the solution, is moulded into the desired shape, allowed to dry, and then submitted to the action of an air pump. When its pores have been finds its way into every part of the stone by atmospheric pressure."

Dr. A. W. Hall.—"I might here allude to a paint which I invented about twenty years ago, which had the property of attaching itself to brick and mortar in a most remarkable manner. It was made by merely stirring a quantity of unslaked lime into lime water."

Dr. Parmelee.—"I noticed, a few days ago, a new application of concrete. It had been placed on the interior of the hull of a ship, forming a lining about four inches thick."

Mr. Hill described the operations which were being carried on in Europe regarding concrete, mentioning the fact that houses were continually going up built of this material.

The discussion was continued for some time longer, and considerable interest in the subject was manifested. The society finally adjourned, to meet again in two weeks, The next meeting will be devoted to the consideration of the "Manufacture and Uses of Corrugated Iron."

Modern Gas Works at Home and Abroad.

[From a Paper read before the British Society of Engineers, by HENRY GORE, Consulting Engineer.]

Among the varied applications of scientific discovery to the purposes of daily life during the last century, few, if any, have attained greater importance than that which relates to the manufacture and application of coal gas. Scarcely a city, town, or village of conside rable size, in this country, or on the Continent, or even in the United States of America, remains unsupplied with this almost indispensable agent in our industrial and social existence. Its use is rapidly extending in more remote regions; for strange as it may appear, there are many peoples and communities who, though persistently resisting useful applications of practical science as dangerous innovations, are yet eager to avail themselves of the use of gas as a source of artificial light and heat, even religious prejudices of the most obstinate character have succumbed to this desire, and we now behold the Christian Church, the Mosque of the Mahometan, the Hindu, the Budhist, and even the Chinese Temple, each illuminated by this simple and beautiful light.

It is not the intention of the present paper to enter into an elaborate description of the dimensions or plan of the buildings, or the character and arrangements of the machinery and apparatus that constitutes a modern gas works. The author proposes to deal rather with those leading principles of construction essential to the production of the greatest amount of light from a given quantity of materials employed; and to the situation in which the manufacture may be most successfully conducted.

Adopting this plan, it will be requisite, at the outset, to consider briefly the important question, "What is the chemical constitution of coal gas?" In the absence of any other well-supported theory, it is the generally received opinion that the light afforded by this gas is due to the amount of solid carbon incandescent in the flame at the moment of combustion.* The two most important gaseous compounds of hydrogen and carbon, are marsh gas, or light carburetted hydrogen, and the other olefiant gas. The composition of the first is represented by the symbols C H, and consists, by weight, of 7.54 of carbon, and 24.6 of hydrogen.

The composition of the second is represented by the symbols, $C_2 H_2$, and consists of 86 parts of carbon and 12 of hydrogen. The permanently gaseous constituents of all coal gas consist essentially of combinations of these two fluids or compound gases; but experiment shows that it is not a chemical union that is formed between them, but simply a mechanical mixture that takes place. Thus some coal gas of low illuminating power consists principally of marsh gas, with a very slight proportion of olefiant gas; other gas, of high illuminating power, contains an excess of olefiant gas. But the value of gas as a source of light is not due entirely to its gaseous constituents, for it almost always contains a certain quantity of vapors, more or less rich in carbon, and, therefore, extremely valuable as light-giving agents. It should be the great object of the gas manufacturer to produce and retain the richer gas and light-forming vapors up to the moment of combustion in the burner. In endeavoring to accomplish this he meets with many difficulties. An important element in the chemical character, and the light-giving capabilities of coal gas, depends on the materials used for its generation, and the obstructions it meets with in its passage from the place of manufacture to the point where it is to be consumed. What is technically called a poor gas coal always yields gas of the most permanent character, and is the most uniform in its amount of illuminating power. With a coal rich in the constituents of olefiant gas, the illuminating power, though actually much greater, is still liable to more variation than is the case with the poorer gas; but the greatest instability is experienced when a mixture of poor and rich coals is used. That this should be the case is very natural. In gas made from the character of material first referred to, we have the least amount of mechanical mixture, owing to the small quantity of olefiant gas or hydrocarbon vapors present. With the use of coals, on the other hand, rich in volatile hydrocarbons, as referred to secondly, we have a greater mixture of poor and rich gas, and likewise an increased quantity of hydrocarbon vapors present; the absolute illuminating power of the compound gas is, therefore, liable to greater deterioration by the deposition of some of its light-giving constituents. But with the description of material referred to thirdly, the greatest depreciation may be looked for. The gas generated from the mixture of poor and rich coal form but a feeble combination, the one with the other. The hydrocarbon vapors are merely held in suspension, and do not enter into union with either of the gases; the slightest obstruction, or the lowering of the temperature, soon destroys this slender connection, and the result is the loss of a very considerable portion of the illuminating elements of such gas. It is strange, yet true, that this last process of manufacturing by mixed material is one very generally adopted to meet the requirements imposed by the Legislature as to the quality of gas. Judging from recent proceedings of Parliament, it appears very probable that a higher standard of illuminating power will be imposed upon a number of gas companies, especially those which supply the metropolis.

In the earlier years of gas-lighting the illuminating power of gas was not regarded as a question of any great importance; the coal or material most easily or cheaply obtained was used, so that rich or poor gas was produced, just as the works happened to be nearest to ordinary or cannel coal. And when opposition was raised against these existing companies, it was always on the ground of price. The most important movement in this direction was that which led to the establishment of the Great Central Company for the supply of the City of London. The two fundamental principles upon which this undertaking started were a low price and a low standard of illuminating power. To carry these proposals into practice, required that the works should be conducted upon a system involving some important modifications and changes in the machinery and apparatus; and a process of manufacture was adopted the main feature of which was to obtain quantity, quality being only a secondary consideration. The principle laid down in the case of the Great Central Company has been more or less applied throughout the country, and the result has been that the constructive details of gas works have been carried out almost exclusively with a view to obtain the largest possible quantity of gas from the materials used for its production. Furnaces affording the greatest heat, retorts exposing the largest carbonizing surface, condensers and scrubbers making the strongest ammoniacal liquor, purifiers of large capacity and surface for the oxide system of purification, monster gasholders, and last though not least, street mains of the dimensions of small tunnels; these, and perhaps some other matters, are the concomitants of cheap gas, as inaugurated at the period above referred to. Subsequent events, however, have shown that at least one of the parties to the arrangement (the gas consumers) have become dissatisfied with their bargain. An agitation which originated some years ago still continues for a repeal of the condition as to quality, and the legislature have so far interfered as to raise considerably the standard of illuminating power; the important question presents itself whether, in meeting this change, it may not be requisite to modify the present mode of constructing gas works, especially in those localities where mixed coals are used for producing gas of the quality required by these new regulations.

FIG. 1. FIG. 2. FIG 3.

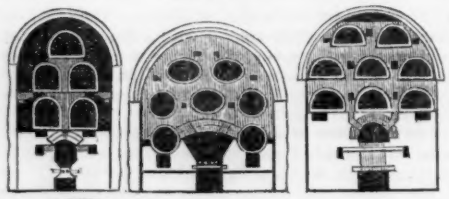


FIG. 4. FIG 5.

A glance at the several sections of the retort settings will show the form and arrangements at present generally adopted. Fig. 1 shows Lowe's (Chartered) setting; Fig. 2 is Jones' (Commercial); Fig. 3 is Evans' (Westminster Chartered); Fig. 4 is Methven's (Imperial, St. Pancras) and Fig. 5 is Gore's (Valparaiso). In large works, and with clay retorts, the system of through setting, with double mouth-pieces, is unquestionably the most economical, both as regards fuel and durability. But this arrangement is open to grave objections. If the retorts are used for the generation of gas of high illuminating power, the increased surface over which the gas passes after it is eliminated from the coal exposes it to the chance of decomposition, and the consequent deposition of its carbon. That this goes on to a very great extent is evident from the amount of solid carbon, or graphite, found on the inner surface of the retorts. In through retorts this deposition is due mainly to two causes; in the first place in charging the retort with coals either by the scoop or shovel the centre of the retort scarcely ever receives its due portion of coal, and as this part is always the hottest, it follows that the gas generated from the thinner stratum of coal is exposed to intense heat, and a portion of it is decomposed, liberating the hydrogen and depositing the carbon, thus forming a deposit which rapidly increases and soon renders the retort useless, unless precautions are taken from time to time to remove the carbon. Another cause of this deposit is the want of uniformity in the pressure in the two hydraulic mains; a slight resistance in one main or the other causes the gas to take the course offering least obstruction, and as the particles of gas thus pass over a large amount of heated surface, they are exposed to the greater risk of decomposition. Several expedients are suggested to remedy this evil; one is to use a valve to each ascension-pipe so as to dispense with the dip-pipe when the retort is working; another is to have only one hydraulic main, placed over the centre of the ovens, and both mouth pieces connected to it by a single dip-pipe.

The material of which the retort is made will exert a very important influence on the production of gas of high illuminating power. The high temperature at which clay retorts are worked tends to produce a very large quantity of carbonic oxide and hydrogen, by the decomposition of the olefiant gas and hydrocarbon vapors. It is frequently asserted that by the use of richer cannel coals, the excess of non-illuminating gas is rendered highly luminous by becoming saturated with the hydrocarbons gixen off from the richer coal; but this is only true to a limited extent, inasmuch as the mixture undergoes rapid deterioration consequent on the liquefaction of a large portion of the hydrocarbon vapors.

We now proceed to consider the operation of the condenser, in the process of gas manufacture. By the term condenser, we usually understand the apparatus acting as a means of cooling or refrigeration, but this is only true in reference to its use where the gas is of poor quality, and of low specific gravity. In treating gases which are to possess high illuminating power it is not desirable to reduce their temperature below 60°. Under these circumstances, therefore, we must look upon the condenser as a separator, and not simply as a refrigerator. The two forms of condensers most generally in use are the tubular, or a series of pipes, and the annular. Whichever of these forms is adopted, a large extent of surface is indispensable, in order that the separation of the mechanical or non-chemical impurities contained in the gas may be gradual. The existence of naphthaline may in many cases no doubt be traced, first, to the high temperature at which the gas is generated, and again to the too sudden reduction of the temperature by rapid and excessive refrigeration. It is a strange anomaly that so much care and labor should be applied to remove so many of the light-giving constituents, and then to give back these elements by the use of costly, and in some cases dangerous, appliances, in naphthalizers, carburetters, and other high-sounding and wonderful specifics.

In the generality of works as now constructed the gas, after leaving the condenser, is subjected to the process of washing, either by the old-fashioned wash vessel, or the more modern contrivance called the scrubber; the object in either case is still further to purify the gas from any remaining particles of tar, heavy oils, and ammonia. As the use of the washer has become almost obsolete, we shall confine ourselves to a few remarks on the action of the scrubber. Many very conflicting statements have been made in reference to the effect of water in removing some of the light-giving constituents from coal gas. Several chemists, who have the reputation of being oracles in these matters, have asserted that water exerts but a small influence in diminishing the illuminating power of coal gas. Some engineers, who certainly have an equal claim to consideration from their great practical experience, say, on the contrary, that water produces a very injurious effect. In the year 1860, the author of this paper, in his capacity of engineer to the Valparaiso Gas Co., was obliged to economize the use of cannel coal on those works, and yet maintain an illuminating standard of eighteen candles. To effect this a series of experiments were made gradually reducing the proportion of Boghead cannel from 30 per cent. to 26 per cent. of the coal used in making the gas; the proportions of coal ultimately decided upon being 60 per cent. of native Chile, 20 per cent. of New Pelton, or Australian bituminous coal, and 20 per cent. of Boghead. The average quantity of gas produced per ton of this mixture was about 10,300 English cubic feet. The condensers were of the annular form, as introduced by Mr. Kirkham; the scrubber was 6ft. diameter and 14ft. high, filled in the usual manner with four tiers of coke and breeze; the water was supplied by a coil of perforated pipe, and a conical dash plate. A water cistern was so placed as to give 3ft. head above the coil; the flow of water through the scrubber was continuous; the mean temperature of the air during the experiments was 17° Cent., or about 61°.6 Fahr. With the apparatus working in its normal condition, and with 30 per cent. of cannel the average illuminating power of the gas was from 23·70 to 24·50 standard candles; on reducing the proportion of cannel to 20 per cent., the light fell to 18

* FRANKLAND has lately shown this to be an error.—ED. GAS-LIGHT JOUR.

and 18·50; the flow of water through the scrubber was diminished, and a slight improvement in the light was observed. After a series of trials a system was adopted of allowing the water to flow for ten minutes, at intervals of two hours. By this arrangement it was found that the gas was sufficiently freed from tarry matter, and the illuminating power of eighteen candles was always maintained, the average being twenty-one candles at the works.

The difficulty of getting rid of the residual products from gas manufacture, particularly ammoniacal liquor, has led to the plan of obtaining a stronger solution of the salts by passing the liquor over and over again through the scrubber. The advocates of this process claim for it among other advantages that more of the hydrocarbon vapors are retained than when the gas comes in contact with pure water; and it is possible that this may be to some extent true, because although each time the liquor comes in contact with the gas, it takes up some particles of hydrocarbon vapor, or it may be some portion of the olefiant gas, yet as in the succeeding stages of its passage, it absorbs more of the ammoniacal gas, the hydrocarbons are, to some extent, liberated, and are taken hold of by the gas in exchange for the particles of ammonia it has taken up; but whether this latter supposition is correct or not, it is certain that the use of a large quantity of water, in any form, is prejudicial to the light-giving elements of coal gas.

In removing from coal gas its chemical impurities, lime is unquestionably the most appropriate agent, and in all situations where it is possible to employ it, it should be used to the exclusion of all other substances. Considerations of economy, and certain sanitary regulations, have induced chemists and engineers to turn their attention to some of the metallic oxides as substances adapted for the purposes of gas purification, and now by common consent certain oxides of iron are used as a substitute for lime in most of our important gas works. The action of this material is to remove the sulphuretted hydrogen, by the union of the sulphur with the iron, forming the black sulphuret or sulphide of iron. When the material is fully saturated it is removed from the purifier, and on exposure to the atmosphere undergoes a series of chemical changes, which result in the precipitation of the sulphur and the re-oxidation of the iron, which again becomes fitted to act as a purifying agent; in fact the process of revivification may be carried on for months before the purifying power of the material is entirely exhausted. In constructing purifiers for the oxide of iron process a much larger superficial area is necessary than when hydrate of lime is employed. It is very questionable, the author ventures to think, whether the practice of increasing the thickness of the layers of the oxide is in all respects good, especially when the material is partially spent. A very objectionable system is now pursued in gas manufacture of disregarding the presence of carbonic acid in gas. The reason assigned for this practice is that the quantity is so small that its interference with the illuminating power of the gas is easily compensated for by adding more cannel in the process of manufacture These petty adulterations for the sake of a paltry economy are unworthy the position of those who have the control of such important undertakings as our modern gas works. Another economic suggestion has been made, namely, the revivification of the oxide in the purifier itself, by allowing a portion of atmospheric air to be drawn through the material along with the gas, thus causing a constant decomposition of the sulphuret as fast as it is formed; the injury to the illuminating power of the gas is to be remedied by that panacea for most, if not all, of the ills attendant on gas-lighting—"a little more cannel"—but any admixture of atmospheric air should certainly be avoided, first, because it is a dishonest adulteration of the gas, and, secondly, because it is unsafe, and may lead to the most disastrous consequences.

(To be concluded in our next.)

Destruction of Fire Damp.—A new invention, it is said, by M. Delaunier, of Paris, for destroying fire-damp in mines, has been lately laid before the Academy of Sciences. It consists of a copper conductor, broken at intervals, but joined by very fine gold wire soldered to the copper; the gold wire being surrounded by flowers of sulphur, which ignite easily. By passing strong currents of electricity through the copper wire, the gold wire becomes red hot, and thus ignites the sulphur, which burns any noxious gases which may be present. It will, of course, be understood that the electric current is made to pass through the apparatus before the descent of the miners into the mine.

☞ What more valuable present can a Gas-Light Company make to its employés than a year's subscription to THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY? They will be conferring a great favor, and the investment will undoubtedly prove a good one.

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—EDS.]

Answer to "Enquirer."

NIAGARA FALLS, N. Y., 4th January, 1868.

MESSRS. EDITORS: In the GAS LIGHT JOURNAL of 16th December, 1868, I noticed an article signed "Enquirer," putting to you certain interrogations in regard to the feasibility of filling a holder 2½ miles distant from the works under certain conditions therein stated, and you request some of the Gas Fraternity to send in an answer. I do not intend in this communication to send you an answer direct, but simply to state facts which may go far towards answering the questions of your correspondent.

In the year 1860 we built the gas-works at Niagara Falls. It was originally a small affair; the largest pipes about the works were but 4 inches, the mains were 4, 3 and 2 inches; 6 retorts; 2 purifiers; capacity of holder 16,000 feet. Our consumption started from 4000 to 6000 feet per day; and, as the village of Suspension Bridge was but two miles distant, I proposed to light that also from these works. To do so, I had to pass over a hill some 40 feet higher than the works, and again descend to our level at starting—the two villages being on the same level. From the works to the highest point of ground, which is about ¼ mile, I laid 4-inch, the balance of the distance 3-inch mains. The working pressure was 2½ inches. I thus furnished a perfect light in both villages for three years, or until our consumption increased to about 15,000 feet per day. I found I could give both a good light with 14,000 feet consumption, and a fair light at 15,000, and not to exceed half a light at 16,000; the reason of this being, that a given quantity of gas can pass through a 4-inch main under 2½ inches pressure, but no more, and the nearer the consumption of the town nearest the works approaches the capacity of the mains, the weaker the pressure in the most distant part of the district supplied. Therefore, I found that 15,000 feet consumption per night was the extreme limit of the works; so far as the more distant consumers were concerned, and in consequence I had to deny all new applicants for gas until I could enlarge the works.

I had an application from a hotel that was making their own gas from coal oil; they had a small holder of about 600 feet capacity. I made arrangements with the proprietor for the use of the holder, the consideration being that I should furnish him gas at the usual price. I then made connections between my mains and this holder, with 1000 feet of 2-inch pipe, checking it down so that it could raise but a given height. This increased our consumption 500 feet per day, and I found that this reserve of 600 feet in the small holder equalized the pressure in the mains at the extreme point of distribution, to that extent, that I was enabled by this new arrangement to supply 18,000 feet per night with a better light at this point than I could 14,000 feet without it. The effect was, that while the greatest consumption was taking place, this 600 feet reserve would supply the deficiency occasioned by the more direct draft from the parent holder, by the nearest consumption to the extent of 4,000 feet per day when the small holder was weighted at 2½ in. pressure.

At midnight this holder would be nearly exhausted, but before morning would be full and remain so, until again employed by the requirements of the consumers in that locality, it being weighted at 1½ to 2 inches, as occasion might require, either giving a good light. I ran this two years until our consumption reached 20,000 feet, at which time it became necessary to enlarge the entire works.

I commenced this enlargement at the weakest point first, which was the purification, and took two years to carry out the entire plan. The first year I had put in new purifiers, centre-seal and washer; enlarging all the pipes and openings from four to six inches; new retort house, two new benches of retorts, new tar well, and more than doubling the entire works with 6-inch openings. The second year I had put up a new holder at the extreme point of consumption two miles distant from the works. This new holder has a capacity for practically storing 19,000 feet of gas (the parent holder only 16,000), is 45 feet in diameter and 15 feet high; it is constructed with inlet and outlet pipes, although but one of these pipes is used. The mains some 2,000 feet in length connecting with the holder are 4-inch, to where they connect with the old 3-inch mains; the new holder being some twenty feet lower than the point of connection with the old mains. There is a cut-off at the holder, and another between the two towns, so that either can be run separately for a given period.

The difference between the pressure of the new and the parent holder is ½ inch less in the former; both holders being situated on the high bluff of the river bank. The new holder can be seen with a glass from the works. I have a signal, painted white, attached to a wire cord that hangs upon the outside of the building, so that with the glass the height of the holder can be ascertained during the day, and the gas let on or off accordingly.

This mode I prefer to checking down the holder at a given height. I find no trouble in keeping the new holder at any required height; the quantity of gas let into it is governed by a shut-off at the works. As a rule, I shut off the gas from the new holder at 7, A. M., so that the pressure upon each town during the day comes from the new holder—letting the gas on at such time in the afternoon as the height of the older demands. This arrangement has been in operation for about two years, making two gas-works from one, two miles apart, and I find when free communication between the two holders is had, the new holder weighted at 2 inches pressure, the old one at 2½, they fill about equal.

Although the above communication is a statement of facts that have transpired under my own observation, yet, in the main, I think it answers substantially the enquiries of "Enquirer." Yours truly,

T. G. HULETT,
Superintendent Niagara Falls Gas Co.

The Tax on Small Gas Works.

NEW ROCHELLE, N. Y., Jan. 12, 1869.

MESSRS. EDITORS: Since I have become familiar with your GAS-LIGHT JOURNAL, I have come to the conclusion that it is an important auxiliary to all who are interested in the manufacture of carburetted hydrogen gas; it is indeed important to have at least one reliable journal that will vindicate the gas-manufacturing interest, and I have read with interest the various communications you have received and published relative to the exorbitant tax imposed upon small gas works, who are trying hard to keep their heads above water, and I hope that some action will be taken by those who are interested in the matter, to bring about a reduction in the tax, and in order to do this some definite plan should be decided upon and *immediate* action taken, whereby a reformation could be brought about; and I think it would be well for *all* who are interested in the matter to drop you a line to that effect, and also to state that they would be willing to pay their portion of whatever expense may be incurred in bringing about said reduction of tax upon small gas works. After you have received an expression from a sufficient number of those interested in the matter, it would be necessary to employ those through whose influence this reduction can be brought about. Yours truly,

CHAS. C. VAN BENSCHOTEN,
President New Rochelle Gas-Light Co.

[We hope the above communication, which speaks to the point, will have the desired effect in waking up the gas fraternity.—EDS. JOURNAL.]

—Mr. Parker, of London, has just made a powerful lens, which is three feet in diameter, three inches thick in the centre, and weighing two hundred and twelve pounds. In the focus of this powerful lens the most refractory metals are almost instantly fused and dissipated in vapor, while unyielding stony substances are as readily vitrified.

Gas Matters in the East.

INTERESTING STATISTICS.

The *Chelsea Telegraph* of Dec. 5th, 1868, contains the interesting information about the progress of gaslighting in the East given below: the statistics of price and tax on gas in the cities specified will be of great value to a large portion of our readers:

The Joint Special Committee to whom was referred the subject of a reduction of the expense of gas having attended to the duty assigned them, submitted the following Report:

The Committee asked and received an interview with the Directors of the Chelsea Gas Co., when the whole matter was fully and kindly considered. The Directors state that the land and works cost originally $85,000; they subsequently added $50,000 to improve and extend five miles of pipe through our streets; they have also expended within three years for extensive repairs the sum of $25,000. They did not receive any dividend for a number of years, and they feel that they are entitled to some return for the use of so much capital. Their works are now large enough, and without much additional expense can supply any quantity of gas that might be required for years to come. There are many cities in New England that have no larger population than Chelsea, yet consume more gas, from the fact of having large hotels and manufacturing establishments, while Chelsea has none.

The Directors express a willingness and a readiness to reduce the price when the receipts will warrant it, and hope the day is not far distant when a sufficient increase in consumption will allow the desired reduction to our citizens. The Co. have reduced the price of gas to consumers, also on street-lamps; the latter 25 per cent.

The City of Boston pay the Boston Gas Co. for gas, per ann.....	$137,505.31
" " South Boston pay the Boston Gas Co. for gas per an.	19,509.08
" " East Boston pay the Boston Gas Co. for gas per ann..	15,909.97
" " Charlestown pay the Charlestown Gas Co. for gas per ann.....	10,996.74
" " Chelsea pays the Chelsea G. Co. for gas per ann., present price.....	4,549.78
The Co. pays the City tax of.....	2,700
	$1,849.78

Brookline pays $30 per ann. per street-lamp.
Dorchester pays $22 " " "
Charlestown pays $3 per 1000 feet for street-lamps.
Cambridge pays $3 per 1000 " "
Roxbury pays $2.75 " " "
East Boston pays $2.70 " " "
Chelsea pays $3 per 1000 or 1835 per an. per lamp.
RATE OF TAXES.—Boston $12.30 on $1,000
Charlestown $14.83 on $1,000.
Chelsea $20.00 on $1,000.

The Charlestown Gas Co. have 400 street-lamps and 2500 meters set for consumers, who pay $11,000, and many who pay from $500 to $700 per annum.

Chelsea Gas Co. have 196 street-lamps and 826 meters set for consumers, who pay $2600 per annum, and the Chelsea Co. furnish gas for street-lamps at the same price that Charlestown Gas Co. do.

The Boston Gas Co. have 2956 street-lamps, and 17,162 meters set, the principal hotels pay $15,600 per annum for gas. The Co. make a discount on bills of $1,000 of 5 per cent.

Chelsea Gas Co. made a discount on bills of $500 of 12 per cent.; and the gas consumed at the City Hall being over $500, the discount of 12 per cent. is allowed. The Company cannot afford to allow the said discount beyond any one meter, notwithstanding the city is a general consumer.

In view of all the facts gathered, and a willingness at all times to open their books and impart any information to the City Government in relation to their profits, your Committee believe the city and citizens are being treated liberally by the said Company, and that there is no just cause for complaint. B. T. MARTIN,
For the Committee.

[We are informed by a correspondent that Jonas Barnard, Esq., for 15 years Sup't of the Jamaica Plain (Mass.) Gas-Light Company, has resigned, and that Mr. J. F. Rogers, of the Boston Gas-Light Co., has been appointed his successor. Mr. Barnard was a faithful and efficient Superintendent, but has in view a position more in consonance with his taste and enterprise. We wish him success wherever he may be.—EDS. GAS-LT. JOURNAL].

Bloomington (Ill.) Gas Works.

We learn from C. W. Douty, Esq., Superintendent of the Bloomington Gas Works, that the company have laid down in the streets of Bloomington more than eleven and a quarter miles of street gas mains, the largest being eight inches in diameter, and from that down to three inch; having laid four miles in the year 1868. That the company intend laying two additional miles the coming summer, and may possibly run an eight inch main to the town of Normal. Bloomington is lighted up with two hundred and fifty lamp posts, located upon all the principal streets of the city, and are lighted under the sanction of the City Council, Main street being lighted a distance of nearly two miles. The capacity of the gas works is sufficient to light a city of sixty thousand inhabitants, and can also extend to and light the town of Normal. The company intend extending their street mains so that all parts of the city can be furnished with gas-light.

We think we may safely say, that Bloomington is more extensively lighted than any other city in Illinois of the same number of inhabitants.

We also learn that the entire capital stock of the Gas Company is owned by a well known old resident of this city, (General A. Gridley,) who has expended a large amount of money in attempting to make this city better lighted than any other city in Illinois outside of Chicago. That the net income from the amount of money invested does not pay more than five per cent. after deducting the government tax, which is twenty cents per thousand, thereby leaving to the company three dollars and eighty cents per thousand for gas, which leaves only a small margin for net profits for the company.

We think that Bloomington may well be proud of her gas works, as in our opinion nothing can make a more favorable impression upon strangers and all persons visiting our city, than to see our streets and public places well lighted by gas.

The city now having over eleven miles of lighted streets is well calculated to show the permanent growth and improvement of our rapidly growing and prosperous city.—*Pantagraph.*

Croton Aqueduct Department.

The annual report of the Croton Aqueduct Department, which was presented at the meeting of the Board of Aldermen on Monday last, is quite extensive and exhaustive in regard to the work performed by the different bureaus into which the department is divided. The following extracts from the report will be found to be of interest:

The collections by this department in 1868 were as follows:

Water rents and penalties.....	$1,232,404
Taps in water pipes.....	9,343
Sewer connections.....	32,791
Vault constructions.....	43,732
Petty cash.....	1,272
Making a total of.....	$1,319,514

The receipts for water were $55,676 95 more than those of 1867, while as compared with the receipts of 1861, the increase is $466,450 60.

Contracts for new stone pavements to the extent of 49,862 superficial yards were made.

The total length of stone block pavements completed and under contract, including Broadway, is eighty-one miles—3,431 feet.

Nicholson pavement laid during the year, 29,073 superficial yards.

The contract price for laying the Nicholson pavement has been $4.75 per square yard.

Total amount of Nicholson pavement now laid, 58,564 superficial yards.

Wall street, from William to Hanover street, was paved with the Stafford pavement at private expense. This is a wooden pavement, differing somewhat in its mode of construction from the Nicholson pavement. The blocks were prepared under what is known as the "Seeley patent."

One hundred and twenty-fourth street, from First to Third avenue, was paved with a composition pavement called the "Fisk concrete pavement," under the "Hiram Burlew patent."

The Croton Board say that this as well as the Stafford pavement were laid too late in the season to furnish any practical test as to their claimed durability.

Under the head of water pipes and laying it appears that 21,453 feet of six-inch pipe, 8,268 feet of twelve-inch pipe and 2,531 feet of twenty-inch pipe have been laid during the year.

The total length of the main pipes now laid is 213 miles, 3,045 feet.

The number of buildings used either as dwellings or for business purposes within the area of water distribution is 60,925. manufactories, 1,617; churches, 307.

The number of buildings supplied with water, for which no revenue is received, is as follows:

Occupied by Metropolitan Fire Department.....	61
Occupied by Metropolitan Police Department....	52
Occupied by Department of Charities and Correction.....	55
Occupied by Board of Education.....	112
Occupied by Markets.....	10
In City Hall Park.....	6
Total.....	296

Water is also supplied for the following purposes, for which no pecuniary return is received by the city: To Commissioners of Central Park, for supplying ponds, sprinkling roads, etc.; to street cleaning contractor, for sprinkling streets, etc.

Bergen City—The Waier Pipe Contract.—At the meeting of the Bergen Common Council on Monday evening a communication was presented from the Water Commissioners, enclosing the proposals for furnishing water pipe to the city, as follows: G. W. Dowling, iron pipe, $127,426; D. & S. Parish, iron pipe, $136,800; Keeny & Halliday, iron pipe, $113,040: C. H. Norman, iron pipe, A $140,000, B $130,000, cement pipe, $89,000; Patent Water and Gas Pipe Company, cement pipe, $20,776; American Water Company, cement pipe, $87,278. The Commissioners recommend the acceptance of Keeny & Halliday's proposal, and that security be fixed at $25,000, but the entire proposals were ultimately referred to the Committee on Fire and Water, with power to accept the lowest bid.

Foreign Gas Items.

We understand from reliable sources that Kingston, one of the most important commercial cities of Jamaica, (British West Indies) is about to have gas-light introduced. It has been a matter of surprise to us that this idea has not been consummated years ago.

We take the following items from the London *Builder* of December 26th:

The district supplied by the Dewsbury and Batley Gas Company comprises the boroughs of Dewsbury and Batley, and the townships of Soothill Nether, and Thornhill, and contains a great number of woollen factories. The almost unparalled increase of Dewsbury and Batley during the last ten years has compelled the gas company to enlarge their works by establishing branch works near Batley, and they have further increased them this year by the addition of a telescope gas-holder, 120 feet diameter and 64 feet high. The tank is constructed of ashlar, and puddled; and the work has been executed by Mr. Crier, of Dewsbury. The gas-holder is supported by twelve massive cast-iron columns, tied together at the top by wrought-iron lattice girders; the gas-holder is from the works of Mr. Benjamin Whitehouse, West Bromwich. A tar and ammoniacal liquor tank, 52 feet diameter and 20 feet deep, has also been added. The whole of the works have been erected and constructed from designs prepared by and under the superintendence of Michael Sheard, of Botley, C. E., at a cost of nearly £13,000.

The Bath Gas Company have decided to reduce the price of their gas 6d. per 1,000 feet, viz., from 3s. 6d. to 3s. The company have also agreed to reduce the charge for the public lamps 5s. for each lamp per annum.

The inauguration of the new gas works at Brandon, which have just been completed, was celebrated by a public dinner at the Chequers Inn. The works have been erected under the personal direction and superintendence of Mr. Wilton, late chief gas engineer to the Continentol Union Gas Company, who happened to come to reside at Brandon for the benefit of his health, just at the time of the formation of the gas company, and who offered his services as engineer gratuitously.

Hudson City (N. J.) Gas Works.—The gas works, which were commenced last June, are nearly completed. The buildings are situated on St. Paul avenue (West), about 1,500 feet from the Hackensack river. Thirteen miles of pipe will be laid, extending from Greenville to the Paterson plank road, in addition to two miles purchased from the Jersey City Commissioners. The total cost is set down at $300,000. The gas holder is 90 feet in diameter and has a capacity of 110,000 cubic feet. It is calculated that 250,000 feet of gas will be manufactured per day, a quantity not very large after all, considering the extent of territory to be supplied. Consumers will be charged $3.50 per 1,000 feet. The works will be in operation about the 1st of February. The officers are—John R. McPherson, President; John R. Mullany, Vice President, and Jeremiah B. Cleveland, Secretary and Treasurer.

—The Santa Clara (Cal.) *News* of Nov. 7th says that the railroad from Santa Clara to San José is in running order, and the cars are making regular trips between the two places. This grand improvement will soon fill the intervening distance between these towns with substantial residences, and make them one.

Fodell's System of Bookkeeping.

The following subscriptions to "Fodell's System of Book-keeping for Gas-Light Companies" have been received, making in all 44:

W. Linsey, Watertown, Wis.
William Stiles, Sec'y Camden Gas Co.
John B. Moffiitt, Philadelphia.
Dennis Long, Prop'r Louisville Pipe Foundry, Louisville, Ky.
Edward D. White, Brooklyn Clay Retort and Fire Brick Works, Brooklyn, N. Y.
Joseph Light, Sup't Dayton Gas Works, Ohio.
John O'Neill, Sec'y Titusville Gas Co., Pa.
La Crosse Gas-Light Co.

—A scientific discovery is reported from Turin, where Prof. Casturani, the celebrated oculist, has found a way of killing animals by forcing air into their eyes a few seconds, and almost without causing them pain. Experiments were recently made at the Royal Veterinary School, and it is said that they have fully proved the truth of the professor's invention. Within the space of a few minutes four rabbits, three dogs, and a goat were killed in this manner. The most remarkable fact is that the operation leaves absolutely no outward trace

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GEORGE C. HICKS.
AUGUSTE LAMBLA, ZENO F. PARUS,
216-1 yr) Foremen of late J. K. Brick & Co., of Brooklyn, N. Y.

West Fairmount Gas Coal Mines.
HENRY Y. ATTRILL, Proprietor.
Mines at Fairmount, Marion Co., West Va.
Oliver Jackson, Esq., Pres. First National Bank of Fairmount, Manager.
Wharves, Hankey's Locust Point, Office, 35 S. Gay-street, } Baltimore, Md.
I offer this superior coal to Gas Companies throughout the United States—SUPERIOR TO ANY. See analysis by Engineer Manhattan Gas Light Company of New York in the "Gas-Light Journal" vol. X., No. 218, p. 217. Orders solicited from Gas Companies, Gas Manufacturers, and shippers of Coal by the cargo. 215-3m

This coal, by analysis of Jos. A. Sabbaton, gave a yield of 9,681 cubic feet, and 9,500 cubic feet to the ton with an ILLUMINATING POWER OF 19.50 CANDLES, AND 40 BUSHELS COKE.

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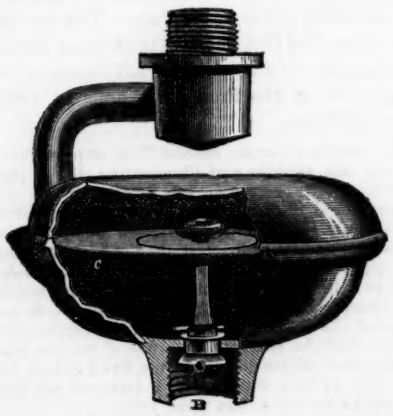
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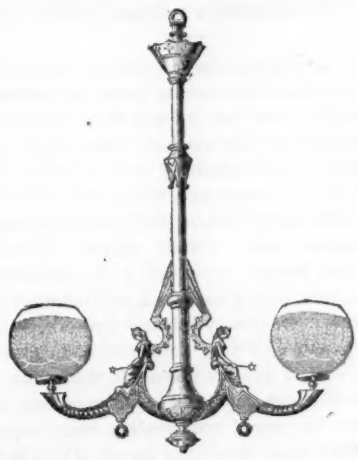
E. BEGGS,
Office American Gas-Light Journal,
212-tf.) No. 22 PINE STREET, NEW YORK.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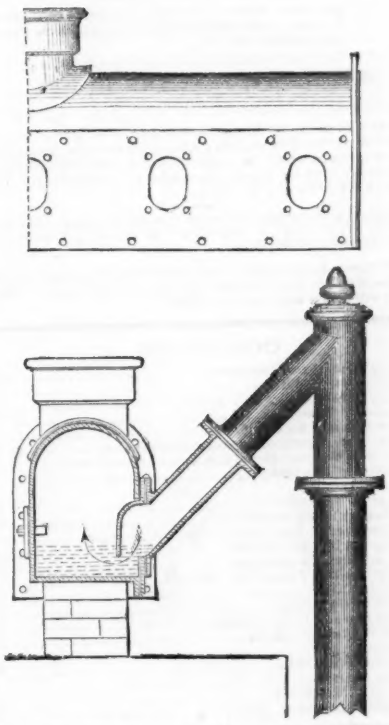
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By the removal of the front plate only the Main can be adopted to Settings of any number of Retorts desired. The Patent Main can be applied to the ordinary D shaped Main. It offers great facilitie for cleaning, and is not liable to stoppage.
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REFERS TO—J. A. Sabattan, Esq., Engineer Manhattan Gas Co—Col. A J. White, Metropolitan Gas Co.—C. C. Mowten, Engineer New-York Gas-light Co.—J. Mowten Saunders, Engineer Baltimore Gas Co.—John T. Harrison, Engineer Savannah Gas Co.
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M. L. CALLENDER & CO.,

EDITORS AND PROPRIETORS.

Consulting Chemist,
Geologist and General Scientist,
PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

SATURDAY, JANUARY 16, 1869.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. Newsdealers will please send orders to them.

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NOTICE.

☞ *All Collections for Advertisements, Subscriptions, etc., are made directly from this Office. We have Agents to solicit the same, but they are not authorized to Receipt for Money.*

☞ We desire our subscribers and patrons to send all remittances in Checks or Post Office orders to insure safety. If money is sent and lost *we cannot be responsible*, when a little care will so easily avoid a contingency.

Answers to Correspondents.

A. J. C., of Steubenville.—Your communication has been received, and will appear in our next.

J. S., of N. C.—The material of which Greek and Roman lamps were composed was chiefly terra-cotta, although some of the better sort were often made of bronze, and even silver and gold.

L. B. T., of Me.—If you will favor us with the Report of your Company for 1868, we shall give it a place in these columns. Send it when convenient.

B. C., of Mo.—Do not touch burning fluid under any circumstances. It is disagreeable to have about, and exceed-ingly dangerous. Where there is no gas, coal-oil is the cheapest, cleanest, and altogether the most satisfactory illuminating agent you can employ. Thereought to be a law prohibiting the use of burning fluid, which often causes fatal accidents.

P. T., of Ala.—The *Superintendent's Pocket Companion* for 1866 contains the following recipe for mending iron retorts, which we copy for you:—15 lbs. fire clay, 1 lb. saleratus, with water to make a thick paste. This must be applied to the broken part of the retort when at a good working heat; after this, cover it with fine coal dust, and charge the retort for working.

DANGEROUS COAL OILS.

When kerosene or coal oil was first introduced to the public as an illuminating agent its commendable qualities were largely dwelt on. Among other recommendations its freedom from explosiveness was particularly emphasized, and its harmlessness placed in glaring contrast with the well known dangerous character of burning fluid, which had become very popular among certain classes. When the public had become reconciled to its characteristic odor its sales largely increased, and the more troublesome and less cleanly fish and lard oils, and the more dangerous burning fluid were obliged to give place in a great measure to coal-oil, the manufacture and sale of which increased in an enormous ratio. With this increase of consumption many improvements were made in refining the oil, which is now manufactured in such purity as to be almost entirely free from any objectionable odor. These improvements of course led to a still greater demand, and on account of the softness and intensity of the light emitted during its combustion, as well as its cheapness, it met with general favor by those who conld not afford the use of gas. It having been a matter of public congratulation that an illuminating agent had been introduced combining so many pleasant qualities, the first accounts of the explosions of coal oil lamps were received with some degree of incredulity, and even after these reports were verified it was suspected that fraudulent admixtures of burning fluid and coal-oil had been made and palmed off upon purchasers by unprincipled vendors. Subsequent examinations, however, have proved that a large proportion of the kerosene oils in the market are, either through the ignorance or cupidity of some manufacturers, or perhaps both, extremely dangerous.

Practically speaking coal-oil consists of a mixture of many hydro-carbons, of variable specific gravities and boiling points ranging all the way from 50 deg. to 600 deg. Fah. Although the attention of chemists has been for some time directed to investigating the peculiar properties of these bodies, and many have been systematically isolated, yet no regular series of compounds have been pointed out whose formulae are always the same, and after all that has been said and written about them, the conclusion arrived at is that which was started from, viz., that they are mixtures of hydro-carbons, each distillation of which breaks up existing compounds and forms others, which in turn are alike resolved into other bodies, whose composition is yet a problem to many chemists. The practical manufacturer divides these oils into heavy and light oils, and as the presence of the more volatile of the latter is the occasion of explosiveness, it should be the object of the refiner to so conduct the distillation as to free the product from such a proportion of the light oil as will not stand a thorough test.

In the early stages of the manufacture, cannel coal was almost exclusively used as the oil-yielding material, but since the discovery of the oil wells of Pennsylvania and the adjoining States the petroleum raised from them has in a great measure supplanted the use of coal—some establishments using the natural oil alone. The object of this is readily appreciated. When petroleum alone is used in the manufacture of kerosene oil, the product contains a much larger proportion of volatile hydro-carbons than when coal is wholly or partially employed, and therefore more precautions are necessary, and greater labor is requisite to effectually get rid of these dangerous substances. Some manufacturers not only neglect to remove those volatile compounds from the oils, but actually purchase the light oils from more conscientious refiners, in order to mix them with heavy oils, to make them burn. This is an exceedingly reprehensible practice and deserving severe punishment; for the heat generated by the heavy oils in burning vaporizes the volatile portion and renders it liable at any time to explode. By a careful refining, and after distillation, steaming, and a large surface of atmospheric exposure, every dangerous compound can be removed, and no fear need be apprehended from oils which are known to be subjected to a rigid and conscientious refining. In purchasing oils, however, nothing should be taken for granted. They should be carefully tested and their liability to explode fully investigated. The simplest and most satisfactory test of safety is to place the oil in an open dish in a water bath and heat it up to 130 deg. or 140 deg. Fah. If when elevated at this temperature, on applying a match it does not ignite, it may be pronounced very safe. I it ignites but slowly or sluggishly, it is safe. But any oil which lights quickly in an open dish at temperatures below 400 deg. Fah. may be considered as dangerous. We have seen oil, the vapor of which ignited with a smart puff or explosion at 60 deg. F. on holding a lighted match more than an inch above its surface. This was dangerous in the highest degree, and the vendor of such a compound should be held to strict accountability for any accident occurring from its being burned in lamps.

The very frequent explosions of coal-oil lamps which have from time to time occurred have led some persons to believe that all oils of similar origin are equally dangerous. It is not to be wondered at that such a conclusion should have been reached by those who are ignorant of the process of their manufacture. Even while this article is being written our attention is called to another "Fatal Kerosene Explosion" at 97 Clinton street, on the 4th inst., by which a girl was fatally burned. On investigation before the Coroner it was shown that the oil was purchased from the paint store of Samuel Schoonmaker, some of which was tested by Mr. Guiseppe Tagliabue and showed a vaporizing test of 68 deg. and a burning point of 80 deg.—the vaporizing point should be at least 96 deg. and the burning point 110 deg.; it was almost pure benzine and extremely dangerous to be burned in lamps. Coroner Keenan very properly held the manufacturers of this explosive compound (Messrs. Reisser & Co., of Williamsburgh) to bail in the sum of $5000 each, and Schoonmaker in the sum of $2000, to await the action of the Grand Jury. This is a step in the right direction, and we trust these parties, if found guilty, will receive the full extent of the law approved by the President March 2d, 1867, which reads thus:

SEC. 29. *And be it further enacted*, That no person shall mix for sale naphtha and illuminating oils, or shall knowingly sell, or keep for sale, or offer for sale such mixture, or shall sell or offer for sale oil made from petroleum for illuminating purposes, inflammable at a less temperature or fire test than one hundred and ten degrees Fahrenheit; and any person so doing shall be held guilty of a misdemeanor, and a conviction thereof by indictment or presentment in any Court of the United States, having competent jurisdiction, shall be punished by a fine of not less than one hundred dollars nor more than five hundred dollars, and by imprisonment for a term not less than six months nor more than three years.

There being so many proofs that kerosene oil is dependent for its safety entirely upon the care and conscience of the manufacturer, it is time that those who exercise this care and conscience should be on the alert, and by their united efforts drive the dangerous stuff entirely out of the market. There are ways of doing this which, to render them successful, require but the concerted action of those who are willing to inaugurate a reform, and see that the law be effectually carried out.

Those manufacturers who are satisfied of the pu-

rity of their own products would surely not oppose a measure of this kind which would afford them a protection and remove from them a large portion of the onus of competition which now falls hurtfully upon them. A movement of this nature would undoubtedly receive a vigorous opposition from those manufacturers who are neither ruled by conscience nor by any other but sordid motives. The cupidity of these persons would prompt a violent resistance to any proposed means of ameliorating the condition of consumers—their own selfish interests being the prominent points of study. The time has arrived when producers of these explosive oils should be forced to relinquish their nefarious calling and embark in one more honorable in its nature and entailing less danger and deaths in the community. As far as this action relates to rectified oils the conscientious refiner may cast the whole odium upon those to whom it should properly attach—those who either ignorantly or wilfully make and vend oils which are palpably dangerous, and which should be driven out of the market, accompanied by the anathemas of all.

A movement should be inaugurated having for its object the passage of a rigid inspection law, in which the tests to be employed should be pointed out with particular emphasis. This will be a wise and proper course, and we commend the consideration of this matter to the attention of those establishments where safe oil is manufactured, many of whom are readers of this Journal. A concerted action on their part may accomplish much, and succeed in ridding the community of those unprincipled scoundrels, also lessening the competition, removing the prejudices which have sprung up against their products, and restoring it to that favor in which it was held a few years ago. It may be urged that a movement of this nature would put up the price of the material. If this were done it would not occasion a material diminution in consumption, for the public would rather pay a fair price for an article in which confidence could be placed, than to buy at a low cost a fluid which is liable at any time to explode, scattering death and destruction around.

In connection with this subject we may state that Professor Chandler has handed us a very interesting and elaborate report made by him on kerosene oil, portions of which have appeared incorrectly in some of the daily papers of this city, which we shall publish in our next issue revised by him in entenso.

SPECIAL NOTICES.

FAIRMOUNT GAS COAL—SECOND ANALYSIS.

MANHATTAN GAS LIGHT COMPANY,
Engineer's Office, 18th St. Station, N. R.
New York, Nov. 14, 1868.

Mr. HENRY ATTRILL, Baltimore, Md.

Dear Sir: I have received two hogsheads West Fairmount Coal, said to be mined from a greater depth than the sample tested October 28th, which was represented to be from the out crop of the vein. This sample is a purer coal than the other. It is in very large pieces, and free from earthy matter.

This coal is unequalled for gas manufacturers, owing to its freedom from sulphur, and as it is not injured by exposure to the atmosphere it is particularly fitted to ship long voyages. For household and office use it is superior to Scotch Cannel, and it can be delivered at any seaport town at half its cost.

Analysis of the Coal:	Volatile Matter	37.0
	Fixed Carbon	39.0
	Ash - -	4.0
		200.0

This maximum yield of gas per ton of 2240 lbs. is 9681 feet. When the yield was restricted to 9500 feet the illuminating power of the gas was equal to 19.50 candles. The yield of coke was 40 bushels, weighing 1500 lbs. The quality was good, making but little ash or clinker. This coal contains considerably less sulphur than the first sample. One bushel of the hydrate of lime purifying 4180 feet of gas.

Very respectfully,
JOS. A. SABBATTON, Engineer.

The attention of gas companies will be directed to the very high illuminating power of the gas and the large amount of coke per ton of coal used, which peculiarly fits it to take the place of English cannel to mix with poor coals to bring up their candle power.

For further information address Henry Y. Attrill, proprietor of West Fairmount Gas Coal Mines, No. 35 South Gay street, Baltimore, Md.

☞ We desire to direct the attention of all manufacturers of gasworks and gas materials, contractors, engineers, and meter manufacturers, etc., to the advertisement of W. P. Fodell, Esq., on page 173. This work, which is now ready to publish, will go extensively into the hands of Gas Companies, Superintendents and gas men generally, and will be an excellent and very economical medium to advertise in. The author gives us the following schedule of prices, with or without cuts:

1 page . . .	$10.00
½ " . . .	6.00
¼ " . . .	5.00
⅛ " . . .	4.00

Subscribers to the book 25 per cent. discount on these prices.

Parties desirous to take advantage of this opportunity will please send their advertisements and the price immediately to W. P. Fodell, Esq., Northern Liberties Gas Company, Philadelphia, Pa.

☞ In this issue of the GAS LIGHT JOURNAL, we have commenced a highly valuable article from the pen of a well known English Gas Engineer, Henry Gore, C. E. The article is given in *extenso* with the exception of some immaterial matter, which we have omitted. We may here mention that in future we shall illustrate articles when of a sufficiently valuable and interesting character. In return we ask the active co-operation of our readers and friends on our behalf, which will enable us to extend our *mains* considerably during the year 1869.

REPORTS OF GAS COMPANIES FOR 1868.—We respectfully solicit from the gas companies of the States, British Provinces, etc., their annual reports for the year 1868, which we desire to receive for publication and reference. The reports need not necessarily be lengthy, but rather condensed as much as possible. We hope that before the next number of the Journal goes to press, the companies will give evidence that they have noticed and acceded to our request. Fall in line!

☞ Some of our subscribers have favored us with much valuable information about gas matters, for which we tender them our sincere thanks. This is as it should be, and others should follow the example, and thereby add considerably to the value of the Journal.

Recent American Patents.

84,675.—Gas Burner.—Julius Bronner, Frankfort-on-the Main, Prussia.
84,678.—Mechanical Movement.—A. R. Buffington, U. S. A.
84,679.—Gas Retort.—Mills L. Callender, New York, assignor to himself and S. L. Holdredge, Greensburg, N. Y.
84,689.—Gas Lighting Device.—E. P. Gleason, New York city.
84,768.—Gas Burner, Edwin P. Russell, Manlius, N. Y.
84,775.—Lamp Burner.—A. G. Smith, Jersey City, N. J. Antedated November 27, 1868.
85,517.—Pump.—Daniel S. Evans, Brockway, Mich.
85,521.—Oil Can.—O. H. Gardner, Fulton, N. Y.
85,536.—Steam Engine.—H. Rockwell, Roanoke, Ind.
85,548.—Pump.—Jas. Underwood, Mason county, Ill.
85,559.—Pipe Connection in Railroad Car Heaters.—Martin S. Bolt, Elmira, N. Y.
85,564.—Hot Air Furnace.—T. E. Coles, Troy, Ohio.
85,596.—Atomizing Tube.—Wm. K. Leuch, Boston.
85,598.—Adjustable Still Water Dam.—Samuel Lewis, Brooklyn, E. D., N. Y.
85,653.—Hydrocarbon Burner.—Samuel A. Hill, Oil City, assignor to himself, Charles M. Thumm, and Oliver P. Scaife, Pittsburgh, Pa.
86,677.—Lamp Chimney.—J. W. Larimore, Chicago, Ill. Antedated December 26, 1868.
85,683.—Water Wheel.—E. W. McGuire, Eaton, O.
84,700.—Car Coupling.—Christian Kohler, Galena, Ill.

New Method of Lighting.

Gas Reduced to One-third its Present Cost.

THE HYDRO-CARBON

Light and Gas Improvement Co.

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This new method of lighting has been thoroughly tested and extensively adopted in Europe, giving general satisfaction, and there is no method of increasing the illuminating power of gas that offers a fraction of the advantages to the consumer guaranteed by this process.

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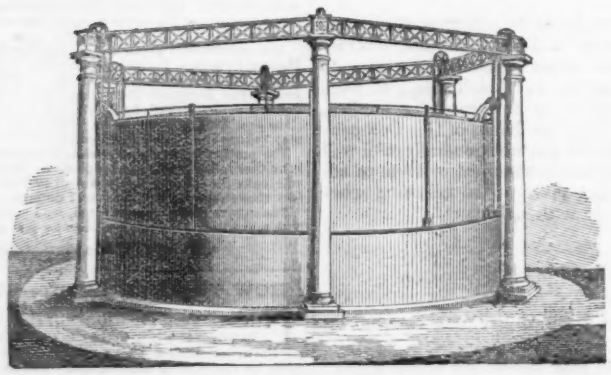

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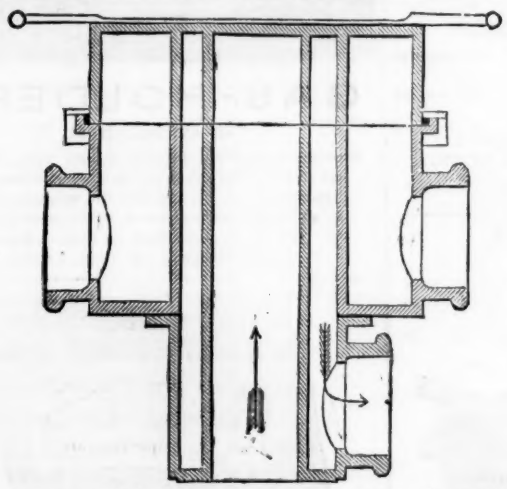

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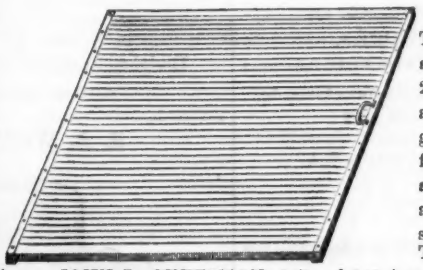

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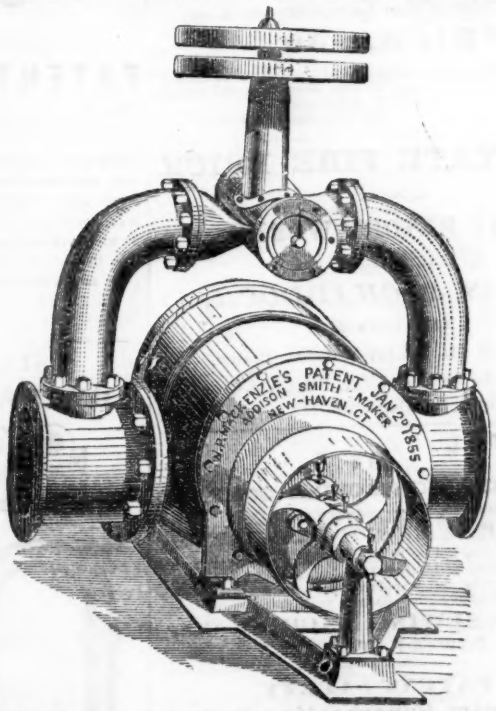

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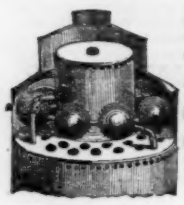

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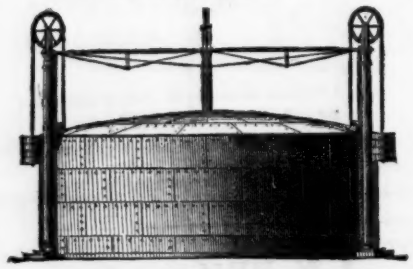

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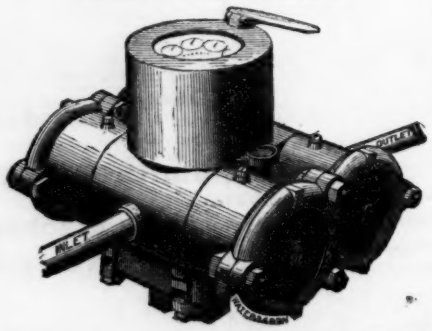

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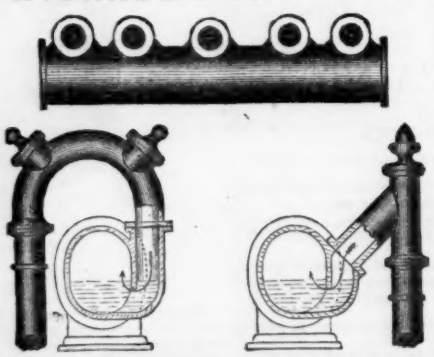

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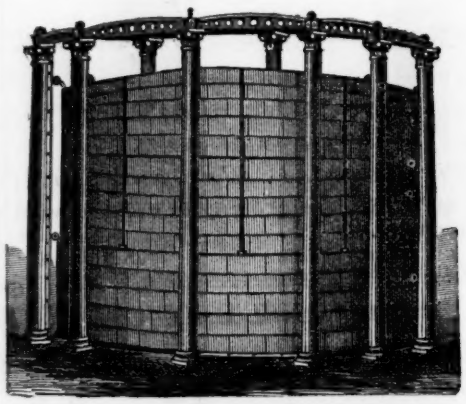

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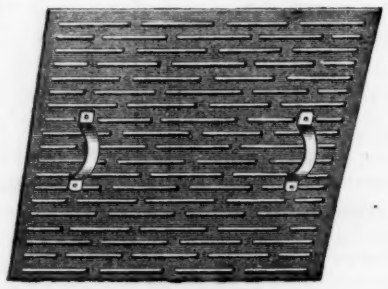

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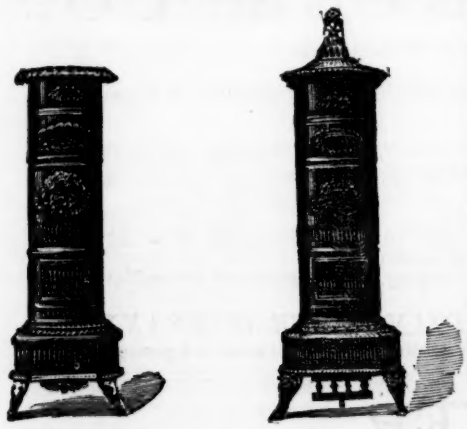

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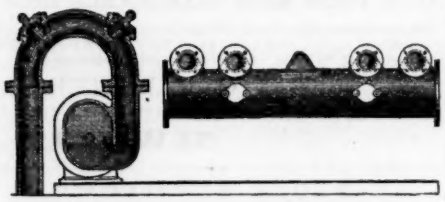

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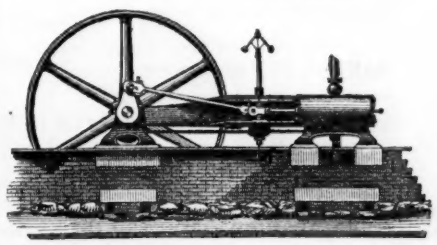

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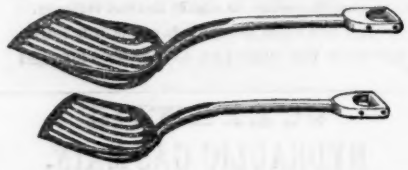

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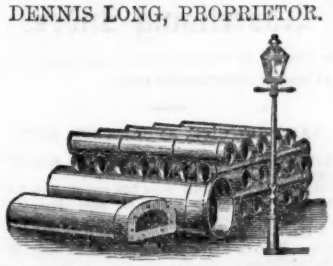

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